

**MACHINE-ASSISTED TRANSLATION (MAT):**

<b>(19)【発行国】</b> 日本国特許庁 (J P)	<b>(19)[ISSUING COUNTRY]</b> Japanese Patent Office (JP)
<b>(12)【公報種別】</b> 公開特許公報 (A)	Laid-open (kokai) patent application number (A)
<b>(11)【公開番号】</b> 特開 2 0 0 0 - 1 6 7 5 5 5 ( P 2 0 0 0 - 1 6 7 5 5 5 A)	<b>(11)[UNEXAMINED PATENT NUMBER]</b> Unexamined Japanese Patent 2000-167555 (P2000-167555A)
<b>(43)【公開日】</b> 平成 1 2 年 6 月 2 0 日 ( 2 0 0 0 . 6 . 2 0 )	<b>(43)[DATE OF FIRST PUBLICATION]</b> June 20th, Heisei 12 (2000.6.20)
<b>(54)【発明の名称】</b> 浸漬膜の洗浄方法	<b>(54)[TITLE]</b> The cleaning method of an immersion film
<b>(51)【国際特許分類第 7 版】</b> C02F 1/44 B01D 65/06 C02F 3/12	<b>(51)[IPC]</b> C02F 1/44 B01D 65/06 C02F 3/12
<b>【 F I 】</b> C02F 1/44 K B01D 65/06 C02F 3/12 S	<b>【FI】</b> C02F 1/44 K B01D 65/06 C02F 3/12 S
<b>【審査請求】</b> 未請求	<b>[EXAMINATION REQUEST]</b> UNREQUESTED
<b>【請求項の数】</b> 4	<b>[NUMBER OF CLAIMS]</b> Four
<b>【出願形態】</b> 書面	<b>[Application form]</b> Document
<b>【全頁数】</b> 7	<b>[NUMBER OF PAGES]</b> Seven
<b>(21)【出願番号】</b> 特願平 1 1 - 7 2 4 3 2	<b>(21)[APPLICATION NUMBER]</b> Japanese Patent Application No. 11-72432

**(22)【出願日】**

平成11年2月12日 (1999.2.12)

**(22)[DATE OF FILING]**

February 12th, Heisei 11 (1999.2.12)

**(31)【優先権主張番号】**

特願平10-311560

**(31)[PRIORITY FILING NUMBER]**

Japanese Patent Application No. 10-311560

**(32)【優先日】**

平成10年9月29日 (1998.9.29)

**(32)[DATE OF EARLIEST CLAIMED PRIORITY]**

September 29th, Heisei 10 (1998.9.29)

**(33)【優先権主張国】**

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**(33)[COUNTRY OF EARLIEST PRIORITY]**

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## 【テーマコード (参考)】

4D006  
4D028

## [Theme code (reference)]

4D006  
4D028

## 【F ターム (参考)】

4D006 GA02 HA19 HA42 HA93  
JA01A JA01B KA02 KA13  
KA43 KB22 KC14 KC16 KD01  
KD02 KD17 KD24 KE02P  
KE07P KE12P KE24P KE28Q  
PA02 PB08 PC11 PC41 PC61  
PC62  
4D028 BC14 BC17 BC26 BD16  
CC05

## [F term (reference)]

4D006 GA02 HA19 HA42 HA93 JA01A JA01B  
KA02 KA13 KA43 KB22KC14 KC16 KD01  
KD02 KD17 KD24 KE02P KE07P KE12P  
KE24P KE28Q PA02 PB08 PC11 PC41 PC61  
PC62

4D028 BC14 BC17 BC26 BD16 CC05

## (57) 【要約】

## 【目的】

好気性廃水処理設備で、分離膜装置をそのままの状態で洗浄し、透過能を回復させる効率的な浸漬膜の洗浄方法。また、分離膜の性能を均一に回復可能とする。他の目的としては、浸漬する分離膜を高密度に設置することを可能とし、このような場合に適用できる方法とする。新規だけでなく、既存設備の改造にも対応可能な方法とする。

## 【構成】

浸漬膜を用いて汚泥から処理水を分離する好気性廃水処理設備において、好気性廃水処理槽とは別に分離膜ユニットを設置する膜分離処理槽を設け、分離膜ユニットを設置したそのままの状態では膜分離処理槽内の被処理水を排出し、次いで酸化剤を含む薬液を膜分離処理槽内に分離

## (57) [SUMMARY]

## [OBJECT]

The cleaning method of an efficient immersion film which cleans a separation membrane apparatus in the condition as it is, and is made to recover a penetrating power with an aerobic waste water treatment installation.

Moreover, the recovery of the property of a separation membrane is enabled uniformly. It is enabled to install the separation membrane to immerse, with high density as the other objective.

It makes as a method applicable in such a case.

It is not only novel, but it makes as the method which can be corresponded also in reconstruction of an existing facility.

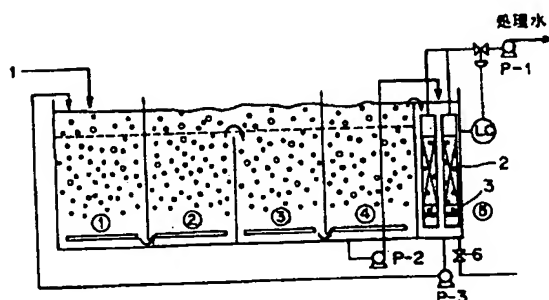
## [SUMMARY OF THE INVENTION]

In an aerobic waste water treatment installation which separates a treated water from sludge using an immersion film, the membrane separation treatment tank which installs a separation membrane unit apart from an aerobic waste water treatment tank is provided. Treated water in a membrane separation treatment tank is ejected in the condition of installing the separation membrane unit.

Subsequently, the chemical solution containing an oxidizing agent is introduced by

膜ユニットの容積の10倍量以下導入して分離膜モジュールを浸漬し、所定時間経過後に薬液を排出することにより分離膜の透過能を回復させる。

10-fold quantity or less of the volume of a separation membrane unit in a membrane separation treatment tank, and a separation membrane module is immersed. The penetrating power of a separation membrane is recovered by ejecting a chemical solution after predetermined time passage.



Treated water

【特許請求の範囲】

[CLAIMS]

【請求項1】

浸漬膜を用いて汚泥から処理水を分離する好気性廃水処理設備において、好気性廃水処理槽とは別に分離膜ユニットを設置する膜分離処理槽を設け、分離膜が汚れた場合に、分離膜を設置したそのままの状態で膜分離処理槽内の被処理水を排出し、次いで酸化剤を含む薬液を膜分離処理槽内に分離膜ユニットの容積の10倍量以下導入して分離膜を浸漬し、所定時間経過後に薬液を排出することにより分離膜の透過能を回復させることを特徴とする浸漬膜の洗浄方法。

[CLAIM 1]

A cleaning method of an immersion film, in which in an aerobic waste water treatment installation which separates a treated water from sludge using an immersion film, the membrane separation treatment tank which installs a separation membrane unit apart from an aerobic waste water treatment tank is provided.

When a separation membrane gets dirty soiled, treated water in a membrane separation treatment tank is ejected in the condition of installing the separation membrane.

Subsequently, the chemical solution containing an oxidizing agent is introduced by 10-fold quantity or less of the volume of a separation membrane unit in a membrane separation treatment tank, and a separation membrane is immersed. The penetrating power of a separation membrane is recovered by ejecting a chemical solution after predetermined time passage.

**【請求項 2】**

還元剤を用いて薬液の酸化剤を中和する請求項 1 記載の浸漬膜の洗浄方法。

**【請求項 3】**

分離膜を薬液に浸漬した状態で、薬液を攪拌する請求項 1 または請求項 2 記載の浸漬膜の洗浄方法。

**【請求項 4】**

膜分離処理槽内の被処理水を排出するに際し、好気性廃水処理槽から膜分離処理槽に被処理水を移動させ、一方で膜分離処理を行い膜分離処理槽の容積に相当する処理水を系外に排出し、これにより活性汚泥処理槽の液面を低下させてから膜分離処理槽内に残留している被処理水を排出し、排出した被処理水を好気性廃水処理槽に移すことを特徴とする請求項 1 から請求項 3 のいずれかに記載の浸漬膜の洗浄方法。

**【発明の詳細な説明】****【0001】****【産業上の利用分野】**

本発明は、活性汚泥処理のような好気性廃水処理設備において用いられる浸漬型分離膜の洗浄方法に係るものであり、各種産業や日常生活を通じて発生するところの、BOD（生物学的酸素消費量）物質を含有している

**[CLAIM 2]**

The cleaning method of the immersion film of the Claim 1 which neutralises the oxidizing agent of a chemical solution using reducer.

**[CLAIM 3]**

The cleaning method of an immersion film described in Claim 1 or Claim 2 which stirs a chemical solution where a separation membrane is immersed to a chemical solution.

**[CLAIM 4]**

A cleaning method of an immersion film described in either of Claim 1 to Claims 3, in which a membrane separation treatment tank is made to move treated water from an aerobic waste water treatment tank in case of ejecting treated water in a membrane separation treatment tank.

The treated water which performs a membrane separation process by one and is equivalent to the volume of a membrane separation treatment tank is ejected out of the group.

After making reduce the liquid level of an activated sludge treatment tank by this, treated water which remains in a membrane separation treatment tank is ejected.

The ejected treated water is moved to an aerobic waste water treatment tank.

**[DETAILED DESCRIPTION OF INVENTION]****[0001]****[INDUSTRIAL APPLICATION]**

This invention concerns on the cleaning method of the immersion type separation membrane used in the aerobic waste water treatment installation like an activated sludge treatment.

It is applicable for purification, such as the waste water, the drainage, the sewage, etc. containing BOD (biological oxygen consumption) substance generated through

廃水、排水、汚水、下水等の浄化のために適用することができる。このような分野を具体的に示すならば、前記の下水や尿尿の生活廃水を始めとして、食品工業、薬品工業、鉄鋼業、化学工業等を挙げることができ、多くの分野において利用可能である。

【0002】

## 【従来の技術】

廃水中のBOD物質を処理するために、活性汚泥を使用する好気性廃水処理設備が多用されている。この方法では、活性汚泥中の微生物が、BOD物質を生体酸化して炭酸ガスや水に分解し、またBOD物質等を体内に取り込んで増殖する。このあと余剰汚泥を分離することで、廃水の浄化が達成される。活性汚泥処理においては、前述のごとく余剰汚泥を分離するための固液分離の操作が不可欠で、これまでのところ沈降槽が最も普及している状況である。

【0003】

近年分離膜の技術的な進歩により、沈降槽の代わりに、膜を用いる膜分離装置が利用されるようになってきた。このように、活性汚泥処理と分離膜とを組み合わせる方法については、いくつかの提案がなされており、活性汚泥処理槽の外部に膜分離部を設け、例えば分離膜として内側に被処理水が通過し、外側へ浄化された水が透過してくるよ

various kinds of industries or a daily life.

If such a field is specifically shown, the food stuff industry, the drug industry, the steel industry, the chemical industries, etc. including the above-mentioned sewage or the life waste water of human waste can be mentioned.

In many field, it is useable.

[0002]

## [PRIOR ART]

Since to treat BOD substance in a waste water, the aerobic waste water treatment installation which uses an activated sludge is used abundantly.

By this method, the microorganisms in an activated sludge carry out the biological oxidation of the BOD substance, and decompose into carbon dioxide or water.

Moreover BOD substance etc. is received inside of the body, and it increases.

Then, purification of a waste water is attained by separating a surplus sludge.

In an activated sludge treatment, operation of the solid-liquid separation for separating a surplus sludge as mentioned above is essential, and is the situation that the settling tank has prevailed most the place so far.

[0003]

By technical advance of a separation membrane, the membrane separation apparatus which uses a film has come to be utilized instead of a settling tank in recent years.

Thus, the some proposal is made about the method of combining an activated sludge treatment and a separation membrane.

A membrane separation part is provided to the outside of an activated sludge treatment tank.

For example, when the tubular shape film which water which treated water passes through inside and was purified outside as a

うな管状膜を用いた場合には、膜の閉塞を避けるために、管内で液を高速で循環させなければならず、そのためにポンプの動力費がかかり、大型の設備には不向きである。

#### 【0004】

これを解決するために、中空糸膜や平膜の分離膜を活性汚泥処理槽内に浸漬し、その下に散気装置を設ける浸漬型膜分離が提案されている。浸漬型膜分離では、水頭差やポンプを利用することで、分離膜の中は減圧に保たれ、汚泥やBOD物質を外側に残したまま、水は膜の外側より内側へと透過し、集められて処理水となり、排出または再利用される。このように浸漬型膜分離は、分離膜を浸漬した浸漬槽内の水深に基づく水頭差や、ポンプの吸引力により低エネルギーで膜分離を行い、透過水を得ることができる。浸漬型膜分離では、汚泥等の汚れが分離膜の外側に付着するため、このまま放置すると、膜としての機能が低下することになり閉塞に至るおそれがあるが、分離膜の下に設置した散気装置に空気を送り込み、適度な気液混層流を発生させると、上昇流によって液が乱れると共に膜エレメント自体が振動することにより、付着した汚泥等の汚れが除かれて分離膜の表面が清浄に保たれるようになっていることが普通である。この他、膜分離装置の間歇停止や膜周辺の循環流れ等を採用することにより、運転時間を長くするように工夫されてい

separation membrane permeates is used, Since to avoid a membranous occlusion, it must be pipe interior and a liquid must be made to circulate at high speed. And, for the reason, the power expense of a pump is taken, and it is unsuitable to the installation of large-size.

#### [0004]

Since to solve this, the separation membrane of a hollow fibre membrane or a flat film is immersed in an activated sludge treatment tank.

The immersion type membrane separation which provides a diffuser to the bottom of it is proposed.

The inside of a separation membrane is maintained at a decompression by utilizing a water head difference and a pump in an immersion type membrane separation. Water permeates sludge and BOD substance inside a membranous outer side still under a remaining outside, and it is collected and it becomes a treated water.

It ejects or recycles.

Thus an immersion type membrane separation performs a membrane separation with a low energy with the water head difference based on the depth of water in the immersion tank which immersed the separation membrane, and the suction force of a pump.

The water-permeation can be obtained.

In an immersion type membrane separation, since the stain of sludge etc. adheres to the outer side of a separation membrane, when leaving it with this, there is a possibility that the function as a film will reduce and it may result in an occlusion.

However, when air is sent into the diffuser installed under the separation membrane and a moderate gas-liquid interstratification style is made to generate, a liquid will be confused by the upflow. Moreover, when the film element itself vibrates, the stain of adhering sludge etc. is removed and the surface of a separation membrane maintains at a cleaning. This is an average.

In addition, by adopting an intermittent stop of



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a membrane separation apparatus, the circulation flow of a film periphery, etc., it devises so that operation time may be lengthened.

**【0005】**

しかしながら、一定期間経過すると浸漬型膜分離装置の膜の内部にまで付着物が入り込むために、膜の性能が低下するので、このような場合には、分離膜の性能を回復させるために膜の洗浄が必要となる。従来は活性汚泥処理槽の中に浸漬されている膜分離部を、クレーンやチェーンブロック等を用いて吊り上げ、別途用意された薬液洗浄槽内に移して浸漬し膜の洗浄を行っている。あるいは、膜モジュールを部分的に取外して別途洗浄する等の方法が実施されている。現状で最も実用的とされているのは、活性汚泥処理槽の中に浸漬されている膜分離部を、クレーンで吊り上げて取外し、新たなスペア膜と交換して、汚れた分離膜をクリーニング工場に集めてまとめて洗浄する方法で、これはサービス巡回法と言われている。

**【0006】**

また、近年では、上述のように分離膜モジュールを移動させることなく、浸漬型膜分離装置をそのままの状態で、分離膜モジュールのろ液側から薬液を通液する洗浄方法（特開平9-75689号公報、特開平10-66844号公報等）が提案され、インライン洗浄法と称されている。しかしながら、膜の洗浄用

**[0005]**

However, since a membranous property reduces in order that a deposit may enter even the inside of the film of an immersion type membrane separation apparatus, when carrying out fixed period passage, since to recover the property of a separation membrane, membranous cleaning is needed in such a case.

Conventionally, the membrane separation part immersed in the activated sludge treatment tank is lifted using a crane, a chain block, etc., and is moved and immersed in the chemical solution washing tank prepared separately, and a film is cleaned.

Or, a membrane module is removed partially and the method of cleaning separately is implemented.

That it should be made in the present condition that it is the most practical lifts and removes with a crane the membrane separation part immersed in the activated sludge treatment tank, and it exchanges for a new spare film.

By the method of bringing the unclean separation membrane together in a cleaning factory, collecting it, and cleaning it, this is called service round method.

**[0006]**

Moreover, in recent years, the cleaning methods (Unexamined Japanese Patent No. 9-75689 gazette, Unexamined Japanese Patent No. 10-66844 gazette, etc.) which sets an immersion type membrane separation apparatus into condition as it is, and pour a chemical solution from the filtrate side of a separation membrane module, without making a separation membrane module move as mentioned above are proposed. The in-line cleaning method is called.

However, in the cleaning method by above-

薬液の使用量が少なくすむとされている分離膜モジュールのろ液側から薬液を通液する前記の逆洗による洗浄方法では、膜への付着物の生成程度に偏りがあるために、膜の付着物の少ないところや閉塞されていない部分からの薬液滲出が多く、均一な膜の洗浄は困難であった。

**【0007】**

一方、活性汚泥処理槽の中に浸漬されている分離膜を移動させることなく、浸漬型膜分離装置をそのままの状態で活性汚泥処理槽内の被処理液を排出し、これに代わって薬液を満たすことによって、分離膜の薬液洗浄を行うことも考えられるものの、特開平9-75689号公報にも記載されているように、分離膜モジュールの大きさに比べて処理槽の容量がかなり大きなものであるため、多量の薬液を要することになり実用的ではないとされている。実際に従来の場合には、分離膜モジュールとその下に設置されている散気装置を含めてユニットとみなした場合の高さが2m以下であり、分離膜ユニット相互の間隔も広くとられていたため、分離膜ユニットと処理槽の容量とは、その容積比が数10倍であった。これは、分離膜ユニットの高さを高くすると、散気装置からの気泡が大きくなるので、洗浄効果が低下するおそれがあるとされていたためであると考えられる。

**【0008】**

mentioned backwashing which pours a chemical solution from the filtrate side of a separation membrane module that small amount is sufficient as the amount of the membranous chemical solution for cleaning used, deviation is in the formation level of the deposit to a film. Therefore, there was much chemical solution exudation from the part not occluded when a membranous deposit is few, and cleaning of a uniform film was difficult.

**[0007]**

On the other hand, the processed liquid in an activated sludge treatment tank is ejected, while setting an immersion type membrane separation apparatus into condition as it is without making the separation membrane immersed in the activated sludge treatment tank move.

Chemical solution cleaning of a separation membrane is performed by filling a chemical solution instead of this. This is also considered. However, compared with the magnitude of a separation membrane module, since the capacity of a treatment tank is quite big as described by Unexamined Japanese Patent 9-75689 gazette, a lot of chemical solutions will be required and it is not practical.

The height at the time of actually regarding as a unit including a separation membrane module and the diffuser currently installed under it in the conventional case is 2m or less.

Since the large space between separation membrane units was also taken, the volume ratio of the separation membrane unit and the capacity of a treatment tank was several 10 times.

It is considered that this is because there was a possibility that a cleaning effect might reduce since the air bubble from a diffuser became large when height of a separation membrane unit was made high.

**[0008]**

**【発明の目的】**

本発明は、活性汚泥処理のような好気性廃水処理設備で、分離膜装置を浸漬した設備において、分離膜を移動させることなくそのままの状態で洗浄する方法を提供するものであり、分離膜の透過能を回復させる効率的な浸漬膜の洗浄方法を意図したものである。また、分離膜の性能回復を部分的なものとすることなく均一に回復できる方法とすることである。本発明の他の目的は、浸漬膜を用いて汚泥から処理水を分離する好気性廃水処理設備における分離膜を高密度に設置することを可能とし、このような場合に適用できる浸漬膜の洗浄方法とすることである。さらには、活性汚泥処理のような好気性廃水処理設備が広く普及している現状に鑑みて、新規に設備を設置する場合だけでなく、既存の設備を利用してそれを改造するような場合においても対応することが可能な浸漬膜の洗浄方法を提供するものである。

**【0009】****【課題を解決するための手段】**

本発明は、浸漬膜を用いて汚泥から処理水を分離する好気性廃水処理設備において、好気性廃水処理槽とは別に分離膜ユニットを設置する膜分離処理槽を設け、分離膜が汚れた場合に、分離膜ユニットを設置したそのま

**[The objective of invention]**

This invention provides the method cleaned in the condition as it is, without making a separation membrane move with the aerobic waste water treatment installation like an activated sludge treatment in an installation which immersed the separation membrane apparatus.

The cleaning method of an efficient immersion film made to recover the penetrating power of a separation membrane is intended.

Moreover, property recovery of a separation membrane is not made partial.

It is making as a uniformly recoverable method.

The other objective of this invention enables it to install the separation membrane in an aerobic waste water treatment installation which separates a treated water from sludge using an immersion film, with high density.

In such a case it is setting as the cleaning method of an applicable immersion film.

Furthermore, the cleaning method of the immersion film which can be corresponded when not only installing an installation newly in view of the present condition that the aerobic waste water treatment installation like an activated sludge treatment has prevailed widely, but converting it using the existing installation is provided.

**[0009]****[SOLUTION OF THE INVENTION]**

This invention provides the membrane separation treatment tank which installs a separation membrane unit apart from an aerobic waste water treatment tank, in an aerobic waste water treatment installation which separates a treated water from sludge using an immersion film.

When a separation membrane gets dirty

まの状態の前記膜分離処理槽内の被処理水を排出し、次いで酸化剤を含む薬液を膜分離処理槽内に分離膜ユニットの容積の10倍量以下導入して分離膜を浸漬し、所定時間経過後に薬液を排出することにより分離膜の透過能を回復させることを特徴とする浸漬膜の洗浄方法である。さらには、還元剤を用いて薬液の酸化剤を中和するようにした浸漬膜の洗浄方法である。上記の浸漬膜の洗浄に際しては、分離膜を薬液に浸漬した状態で、薬液を攪拌することが望ましい。

【0010】

## 【発明の実施の形態】

本発明では前記のような従来技術における問題を克服するために種々検討を行い、槽内に分離膜を設置したそのままの状態での膜の洗浄が実施できる方法を開発したものである。本発明では、好気性廃水処理設備における膜分離処理を効率化すると共に、設備をコンパクトにし敷地を有効活用するために、好気性廃水処理槽とは別に分離膜ユニットを設置した膜分離処理槽を設け、この膜分離処理槽の容積をできるだけ少なくし、分離膜ユニットをできるだけ高密度に設置するようにする。前記のごとく分離膜を高密度に設置するこ

soiled, treated water in an above-mentioned membrane separation treatment tank is ejected in the condition of installing the separation membrane unit. Subsequently, the chemical solution containing an oxidizing agent is introduced by 10-fold quantity or less of the volume of a separation membrane unit in a membrane separation treatment tank, and a separation membrane is immersed. The penetrating power of a separation membrane is recovered by ejecting a chemical solution after predetermined time passage.

It is the cleaning method of the immersion film characterized by the above-mentioned.

Furthermore, it is the cleaning method of the immersion film which was made to neutralise the oxidizing agent of a chemical solution using reducer.

It is in the condition which immersed the separation membrane to the chemical solution in case of cleaning of an above-mentioned immersion film, and it is preferable to stir a chemical solution.

【0010】

## [Embodiment]

Since to conquer the problem in the in this invention above PRIOR ARTs, various study is performed.

The method that membranous cleaning can be performed in the condition of installing the separation membrane in a tank is developed.

Since to make an installation compact and to carry out effectiveness activity of the site in this invention while increasing the efficiency of the membrane separation process in an aerobic waste water treatment installation, the membrane separation treatment tank which installed the separation membrane unit apart from the aerobic waste water treatment tank is provided.

The volume of this membrane separation treatment tank is decreased as much as possible, and a separation membrane unit is installed as with high density as possible.

とにより、膜分離処理槽の洗浄処理に際して液の移送量を少なくすることができるうえ、膜の洗浄用薬液の使用量が少なくすむようにした。

#### 【0011】

本発明の浸漬膜の洗浄方法について図面を基に説明する。図1は、本発明で使用する好気性廃水処理設備の一例を示すものである。図中の(circled-1)～(circled-4)は活性汚泥処理槽で、活性汚泥処理槽(circled-1)～(circled-4)は連通しており、その底部に曝気のための装置が設置されている。(circled-5)は分離膜ユニットを設置した膜分離処理槽である。活性汚泥処理槽と膜分離処理槽(circled-5)とは隔壁により区分されているが、浸漬膜の洗浄時以外には、活性汚泥処理槽の被処理水が隔壁の上部を越えて膜分離処理槽(circled-5)へ流れ込むようになっている。図1の膜分離処理槽(circled-5)に設置されている分離膜装置は、例えば図2に示すようなもので、中空糸膜や平膜の濾過膜エレメントの多数をまとめて保持枠に固定した分離膜モジュール4を、必要数組み合わせてあり、その周囲に分離膜モジュール4に外接するようにしてシェル5が設けられている。分離膜モジュール4の下方には、散気管等の散気装置3が設置されており、そこからの供給空気により液の乱れと膜の振動が生ずるうえ、シェル5の内側に気液混層流が生じ循環流れ

By installing a separation membrane with high density as mentioned above, the amount of transfers of a liquid can be decreased in case of the washing process of a membrane separation treatment tank. Furthermore, the amount of the membranous chemical solution for cleaning used is few, and was made to end.

#### [0011]

The cleaning method of the immersion film of this invention is explained on the basis of a drawing.

Figure 1 shows an example of the aerobic waste water treatment installation used with this invention.

(circled-1)～(circled-4) in a figure is an activated sludge treatment tank. The communicating of the activated sludge treatment tank (circled-1)～(circled-4) is carried out.

The apparatus for an aeration is installed by the bottom part.

(circled-5) is the membrane separation treatment tank which installed the separation membrane unit.

The activated sludge treatment tank and the membrane separation treatment tank (circled-5) are divided by the partition.

However, besides the time of cleaning of an immersion film, the treated water of an activated sludge treatment tank exceeds the upper part of a partition, and flows into a membrane separation treatment tank (circled-5).

It seems that the separation membrane apparatus currently installed by the membrane separation treatment tank (circled-5) of Figure 1 is shown, for example, in Figure 2.

The required number of the separation membrane module 4 which a majority of membrane filter elements of a hollow fibre membrane or a flat film were collected, and was fixed to the support frame are combined.

As it circumscribes to the separation membrane module 4, the shell 5 is provided to the circumference.

The diffusers 3, such as an aeration pipe, are installed underneath the separation membrane

となり、分離膜への汚れの付着を防止している。分離膜エレメントを収納する容器は、液の流れを邪魔せずに、汚泥等のつまりを生ずることのないように、膜エレメントを固定する枠体だけでも、通液性のよいように開口部面積の大きい網状のものであってもよい。材質的には強度と耐食性があればよく、金属でもプラスチックでもかまわない。

#### 【0012】

本発明では膜分離処理を効率化するために、好気性廃水处理槽とは別に膜分離処理槽を設け、その中に分離膜ユニット2を設置するようにし、分離膜を高密度に設置するようにしている。図2のごとく膜モジュール4を複数組合せ、その下方の散気装置3と、それらの周囲を囲繞するように設けられているシェル5を含めて一つのユニットを表しており、膜分離処理槽に当該ユニットを必要に応じて複数を並べて設置する。膜分離処理槽の容積は、分離膜ユニットの容積に対してできるかぎり小さくすることが望ましい。膜の洗浄の際の液の移送量と使用する薬液の量を少なくするため、膜分離処理槽の容積を小さくし、水深に基づく水頭差を有効に活用すると共に、できるだけ分離膜を多く配置するために縦方向に分離膜モジュールを重ねるよう

module 4.

In a vibration of disorder and the film of a liquid arising by the supply air from there, a gas-liquid interstratification style is generated inside a shell 5, and it becomes a circulation flow.

Adherence of the stain to a separation membrane is prevented.

The container which accommodates a separation membrane element may be the form of a net with large vent size so that the jamming of sludge etc. may not be produced, without interfering with the flow of a liquid and the penetrant with only of the frame which fixes a film element may be fine.

There should just be strength and corrosion resistance in material.

Plastics are sufficient even if it is metal.

#### [0012]

Since to increase the efficiency of a membrane separation process in this invention, a membrane separation treatment tank is provided apart from an aerobic waste water treatment tank.

It is made to install the separation membrane unit 2 in it.

It is made to install a separation membrane with high density.

As shown in Figure 2, multiple membrane modules 4 are combined, and the one unit is shown including the diffuser 3 of the lower part, and the shell 5 provided so that their circumference may be surrounded.

Depending on necessity, multiple is arranged in a membrane separation treatment tank, and a unit is installed to it.

As for the volume of a membrane separation treatment tank, it is preferable to make it as small as possible to the volume of a separation membrane unit and to make it small.

Since to decrease the amount of transfers of the liquid in the case of membranous cleaning, and the quantity of the chemical solution to use, the volume of a membrane separation treatment tank is made small.

While utilizing effectively the water head

にして設置することが望ましく、膜分離処理槽は少なくとも液深 3 m 以上とすることが望ましい。

#### 【0013】

膜分離処理槽では、汚泥から処理水を分離する場合には、図 3 に示すように散気装置からの空気により気液混層流が生じ分離膜ユニット内を上昇し、ユニット上部で液流が反転して、ユニットの外側あるいはユニットの間を下降することにより、分離膜ユニットの内側と外側における循環流を形成する。分離膜の汚れを防ぐためには、円滑な循環流の形成が不可欠であるが、膜分離処理槽内に分離膜ユニットをあまり高密度に設置すると、かえって循環流を阻害し、膜の汚れを助長することもあるため、目安としては分離膜ユニットの平面図総面積が、膜分離処理槽の平面図総面積の  $1/2$  迄にとどめることが望ましい。膜分離処理槽の大きさは、処理条件や設置場所等に基づいて決められるものであるが、汚泥から処理水を分離する場合に図 3 に示したごとく、槽内に循環流を形成させるために、設置した分離膜ユニットを浸漬したうえに、ユニット上部において液流が反転・下降してスムーズに液が流動するための液空間が必要であるから、少なくとも分離膜ユニットが浸漬可能で、その上部に槽内に適当な循環流が形成されるだけの液空間を含めた容

difference based on depth of water. Since to configure many separation membrane as much as possible, it is preferable to install it to a vertical direction, as a separation membrane module is piled up. As for a membrane separation treatment tank, it is preferable to carry out to more than liquid depth 3m at least.

#### [0013]

In a membrane separation treatment tank, in separating a treated water from sludge, as shown in Figure 3, a gas-liquid interstratification style is generated with air from a diffuser, and it raises the inside of a separation membrane unit.

A liquid flow is reversed in the unit upper part.

By descending between the outer side of a unit, or units, the circulating flow in the inner side and the outer side of a separation membrane unit is formed.

Since to prevent the stain of a separation membrane, the formation of a smooth circulating flow is essential.

However, when installing a separation membrane unit not much with high density in a membrane separation treatment tank, a circulating flow will be inhibited on the contrary.

Since the stain of a film may be encouraged, it is preferable that the top view total area of a separation membrane unit limits by  $1/2$  of the top view total area of a membrane separation treatment tank as a standard.

The magnitude of a membrane separation treatment tank is decided based on process conditions, an installation place, etc.

However, when separating a treated water from sludge, as shown in Figure 3, Since to make a circulating flow form in a tank, the liquid space for immersing the installed separation membrane unit, a liquid flow reversing and descending in the unit upper part further, and a liquid flowing smoothly is necessary. Therefore, the volume which could immerse the separation membrane unit at least and included the liquid space where a circulating flow suitable in a tank is formed in the upper part is necessary.

Since to make cleaning of an immersion film

積が必要である。また、本発明では浸漬膜の洗浄を効率的かつ経済的にするために、洗浄の際の薬液の使用量をできるだけ少なくするようにしており、浸漬膜の薬液洗浄の際に、膜分離処理槽内に導入する薬液の量は、少なくとも分離膜ユニットを浸漬する量は必要であるが、本発明では分離膜を高密度に設置しているため分離膜ユニットの容積の和の10倍以下、好ましくは8倍以下、より好ましくは5倍以下になるようにする。

**【0014】**

活性汚泥処理の際には、分離膜ユニット2がポンプP-1に接続しており、分離膜の中は減圧に保たれ、水は膜の外側より内側へと透過して処理水となる。実際の運転では、空気による散気だけではなく、膜への汚れの付着を少なくするために、ポンプP-1を間歇的に運転し短時間の停止を組み込むことで汚泥の剥離を促進するようなことがなされている。一方、膜分離処理槽(circled-5)内に濃縮してくる汚泥は、ポンプP-3を経由して活性汚泥処理槽に戻される。尚、余剰汚泥の排出は、必要に応じて弁6を操作して実施したり、ポンプP-3を経由する返送管路の途中から抜き出すようにしてもよい。しかしながら、時間の経過と共に汚れの付着により次第に分離膜の性能が低下するため、吸引しているポンプが一定の圧力を示すようになったり、一定時間を経過した場合には、浸漬してある分離膜

efficiently and economical in this invention, it is made moreover, to decrease the amount of the chemical solution used in the case of cleaning as much as possible.

The quantity which the quantity of the chemical solution introduced in a membrane separation treatment tank in the case of chemical solution cleaning of an immersion film immerses a separation membrane unit at least is necessary.

However, since a separation membrane is installed with high density in this invention, it is 10 or less times of the sum of the volume of a separation membrane unit.

Preferably, it becomes 5 or less times more preferable 8 or less times.

**[0014]**

The separation membrane unit 2 has connected with a pump P-1 in the case of an activated sludge treatment.

The inside of a separation membrane is maintained at a decompression, and water is permeated inside a membranous outer side and turns into a treated water.

In the actual running, since to decrease adherence of a stain not only on the aeration by air but a film, Accelerating peeling of sludge is made by running a pump P-1 intermittently and integrating a short-time stop.

On the other hand, sludge which concentrates in a membrane separation treatment tank (circled-5) goes through a pump P-3, and is returned to an activated sludge treatment tank.

In addition, the ejection of a surplus sludge operates and performs a valve 6 depending on necessity.

Moreover, it may be made to extract from the middle of the return pipeline which goes through a pump P-3.

However, in order that the property of a separation membrane may reduce gradually by adherence of a stain with passage of a time, the pump currently sucking comes to show an fixed pressure.

Moreover, when passing fixed time, it is made



の洗浄を行うようにする。分離膜の汚れの程度が軽微な場合には、簡便な洗浄方法、例えば膜分離処理槽内の水位を下げて圧力水を噴射したり、前述のインライン洗浄法に準じて、分離膜の内側から洗浄水や薬液を流すことにより、膜の性能がある程度は回復するので、これらの方法を採用することが多い。しかしながら、これらの簡便な洗浄では膜性能の回復が完全に行われないために、ある程度の期間において本発明の洗浄方法を適用し、膜の性能回復を図ることが必要となる。

**【0015】**

本発明の膜分離処理槽(circled-5)内の浸漬膜の洗浄操作は、次のような手順で実施する。最初に活性汚泥処理槽への被処理水(原水)1の供給を停止し、活性汚泥処理槽(circled-4)より膜分離処理槽(circled-5)へポンプP-2を作動させて被処理水を移し、この間もポンプP-1は稼働している状態で、膜分離処理槽(circled-5)とほぼ同じ容積の処理水を排出させたならば、ポンプP-1を停止する。すなわち、この操作により活性汚泥処理槽(circled-1)～(circled-4)の液面が、図1中の点線で表したように膜分離処理槽(circled-5)と同容積分だけ低下することになる。

**【0016】**

次に、ポンプP-3を用いて膜分離処理槽(circled-5)内の被処

理水を移動させる。

When the level of the stain of a separation membrane is light, the water level in a simple cleaning method, for example, membrane separation treatment tank, is lowered, and pressure water is injected.

Moreover, it applies to the above-mentioned in-line cleaning method correspondingly.

Since it recovers, the level which has a membranous property by pouring a wash water and a chemical solution from the inner side of a separation membrane adopts these methods in many cases.

However, in these simple cleaning, since recovery of membranous ability is not performed completely, it is necessary to apply a certain amount of period the cleaning method of this invention, and to attempt property recovery of a film.

**[0015]**

Cleaning operation of the immersion film in the membrane separation treatment tank (circled-5) of this invention is performed in the following procedures.

Supply of the treated water (raw water) 1 to an activated sludge treatment tank is stopped initially. From an activated sludge treatment tank (circled-4), a pump P-2 is made to operate to a membrane separation treatment tank (circled-5), and treated water is moved.

A pump P-1 is in the condition of working, and if the treated water of the almost same volume as a membrane separation treatment tank (circled-5) is made to eject, it will also suspend a pump P-1 in the meantime.

That is, as an activated sludge treatment tank (circled-1) - (circled-4) liquid level showed with the dotted line in Figure 1 by this operation, it reduces by the membrane separation treatment tank (circled-5) and the same volume.

**[0016]**

Next, the treated water whole quantity in a membrane separation treatment tank (circled-5) is moved to an activated sludge treatment tank

理水全量を活性汚泥処理槽に移し、膜分離処理槽(circled-5)を空にしてから、必要に応じて水洗した後酸化剤を含む薬液を膜分離処理槽(circled-5)に導入して分離膜を浸漬する。酸化剤としては、次亜塩素酸ナトリウム、オゾン、過酸化水素等の膜の汚れを形成している有機物を酸化分解するのに効果的なものを使用することが望ましい。この中でも次亜塩素酸ナトリウムの使用が好ましいものである。また、酸化剤を作用させる際の液性をアルカリ性とした方が、洗浄が効果的に行うことができる場合があるので、このような場合には少量のアルカリを添加してもよい。酸化剤を含む薬液を膜分離処理槽(circled-5)に導入した後、極く短時間ポンプP-1を作動させると、薬液が分離膜の内部にまで入り込むことになり、浸漬中の膜の洗浄を効率的に行うことができるので、このような操作を採用してもよい。分離膜を浸漬して所定時間経過後に、使用済み薬液を膜分離処理槽(circled-5)から弁6を開けて排出する。分離膜の薬液による浸漬時間としては、膜の使用目的、使用状態、膜の汚れや閉塞の程度にもよるが、数時間から48時間程度とし、浸漬中は散気装置3を稼働させて槽内の薬液をゆっくり移動させることが望ましい。前述のように活性汚泥処理槽に膜分離処理槽(circled-5)と同容積分だけのスペースを用意して、膜分離処理槽(circled-5)からの被処理水を移す方法が、特別な設備、装置

using a pump P-3.

After emptying a membrane separation treatment tank (circled-5), after washing in water depending on necessity, the chemical solution containing an oxidizing agent is introduced into a membrane separation treatment tank (circled-5), and a separation membrane is immersed.

As an oxidizing agent, it is preferable to use sodium hypochlorite, ozone, and the thing is effective for carrying out the oxidative degradation of the organic substance which is forming the stain of films, such as a hydrogen peroxide.

Use of sodium hypochlorite is this preferable thing among them.

Moreover, since cleaning may be able to perform effectively, in such a case, the direction which made alkaline the liquid at the time of making an oxidizing agent act may add a small amount of alkali.

After introducing the chemical solution containing an oxidizing agent to a membrane separation treatment tank (circled-5), when making the short-time pump P-1 operate extremely, a chemical solution will enter even the inside of a separation membrane.

Since the film under immersion can be cleaned efficiently, such operation may be adopted.

A separation membrane is immersed, and after predetermined time passage, from a membrane separation treatment tank (circled-5), a valve 6 is opened and an used chemical solution is ejected.

As an immersion time by the chemical solution of a separation membrane, it is based also on the stain of a membranous purpose of use, a working condition, and a film, or the level of an occlusion.

However, it may be about 48 hours from several hours.

It is preferable to work a diffuser 3 and to make the chemical solution in a tank move slowly in an immersion.

A membrane separation treatment tank (circled-5) and the space only for the same

を設けることなく簡単な操作で実施できるために好ましい方法であるが、この他沈降槽や大型の受器があればそれらを被処理水の一時的な保持のために利用してもよいことは当然であり、本発明の趣旨を逸脱するわけではない。

**【0017】**

使用済み薬液の酸化剤は系外に排出されるまでに無害化されていることが望ましいので、膜分離処理槽(circled-5)内で還元剤を用いて酸化剤を中和した後に排出することでもよいし、膜分離処理槽(circled-5)から排出してから還元剤で酸化剤を中和してもよい。還元剤は、使用した酸化剤を中和させることができ、排出に際して特別の処理を要しないようなものであればよく、チオ硫酸ナトリウム、亜硫酸ナトリウム等を使用すればよい。また、先に酸化剤と共にアルカリを使用した場合には、これも硫酸等で中和して排出することが望ましい。その後必要に応じて膜分離処理槽(circled-5)や分離膜を水洗浄してから、被処理水（原水）1を活性汚泥処理槽への供給を開始し、活性汚泥運転を再開する。

**【0018】**

上記の本発明の浸漬膜の洗浄方法を基本としていろいろな変更が可能である。例えば、図1の

volume are prepared for an activated sludge treatment tank as mentioned above.

Since it can be performed by simple operation, without the method of moving the treated water from a membrane separation treatment tank (circled-5) providing a special installation and an apparatus, it is a preferable method.

However, if there are a settling tank and an acceptor of large-size in addition to this, naturally, they may be utilized for the temporary retaining of treated water.

It does not necessarily deviate from the meaning of this invention.

**[0017]**

Since it is preferable to make harmless by the time it ejects out of the group, it is possible for the oxidizing agent of an used chemical solution to eject, after neutralising an oxidizing agent within a membrane separation treatment tank (circled-5) using reducer.

After ejecting from a membrane separation treatment tank (circled-5), an oxidizing agent may be neutralised by reducer.

Reducer can neutralize the used oxidizing agent.

What is sufficient is just not to require a special process in case of an ejection.

What is sufficient is just to use sodium thiosulfate, sodium sulfite, etc.

Moreover, when using an alkali with an oxidizing agent previously, it is preferable to also neutralise and eject this with a sulfuric acid etc.

After carrying out the backwashing by water of a membrane separation treatment tank (circled-5) or the separation membrane depending on necessity after that, supply to an activated sludge treatment tank is started treated water (raw water) 1.

The activated sludge running is restarted.

**[0018]**

Alteration various as foundations is possible in the cleaning method of the immersion film of above-mentioned this invention.

膜分離処理槽(circled-5)に設置された膜分離装置として2セットを図示してあるが、膜分離処理槽(circled-5)をさらに区分しておき一方を洗浄させている間も片方の膜分離装置を稼働させて連続運転を行うようなことも可能である。また、図4に示すように、膜分離処理槽(circled-5)を活性汚泥処理槽と離れた位置に設け、両者の間をポンプ等を用いて液を移動させるようにしてもよい。尚、図4の場合にあっても、本発明の洗浄操作としては先の手順と基本的に同じである。

【0019】

## 【実施例】

## 実施例1

図1の構成の活性汚泥処理の設備を用いて、被処理水1500m<sup>3</sup>/日の処理を行った。被処理水(原水)のBOD値1400ppmを処理水のBODとして11ppmになるようにし、膜分離処理槽(circled-5)ではMLSS10,000ppmで容積負荷0.7kgBOD/m<sup>3</sup>日で運転した。中空糸濾過膜の端部を保持部に固定した中空糸膜エレメントを容器内に収納した中空糸膜モジュールを準備し、該中空糸膜モジュール4個を組み合わせ、図2のような下部に散気管3を配した分離膜ユニットを配置した。浸漬型分離膜装置として前記の分離膜ユ

For example, two sets are illustrated as a membrane separation apparatus installed by the membrane separation treatment tank (circled-5) of Figure 1.

However, the membrane separation treatment tank (circled-5) is divided further. While making one clean, it is also possible to work one side's membrane separation apparatus and to perform a continuous operation.

Moreover, as shown in Figure 4, a membrane separation treatment tank (circled-5) is provided to an activated sludge treatment tank and a separated position.

It may be made to make a liquid move both between using a pump etc.

In addition, even when it is in the case of Figure 4, as cleaning operation of this invention, it is basically the same as that of a previous procedure.

【0019】

## 【Example】

## Example 1

The installation of the activated sludge treatment of the composition of Figure 1 is used.

The process by 1500m<sup>3</sup>/days of treated water was performed.

It is BOD value of 1400 ppm of treated water (raw water) made to be set to 11 ppm as a BOD of a treated water.

It ran in volume load 0.7kgBOD/m<sup>3</sup> days in MLSS10,000 ppm at the membrane separation treatment tank (circled-5).

The hollow fibre membrane module which accommodated in the container the hollow fibre membrane element which fixed the edge part of a hollow fibre membrane filter to the retainer is prepared. These four hollow fibre membrane modules were combined, and the separation membrane unit which distributed the aeration pipe 3 in the lower part as shown in Figure 2 has been configured.

As an immersion type separation membrane

ニットを30基設置し、膜分離処理槽(circled-5)の容積を200 m<sup>3</sup>とした。尚、前記の分離膜ユニット1基あたりの処理量は50 m<sup>3</sup> /日であり、ユニット1基の容積は2.4 m<sup>3</sup> (ユニット高さ3.5 m)で、30基では72 m<sup>3</sup>である。活性汚泥処理の運転を開始して6カ月後、ポンプP-1の吸引圧力が当初3 m程度であったものが7 mを示し、分離膜装置の処理量が50 m<sup>3</sup> /日から45 m<sup>3</sup> /日に低下したため浸漬膜の洗浄を行った。最初に活性汚泥処理槽への被処理水(原水)1の供給を停止した。その後、活性汚泥処理槽(circled-4)より膜分離処理槽(circled-5)へポンプP-2を作動させて被処理水を移し、この間もポンプP-1を稼働させて、膜分離処理槽(circled-5)とほぼ同じ容積の処理水を排出させ、活性汚泥処理槽(circled-1)~(circled-4)の液面を膜分離処理槽(circled-5)とほぼ同容積の分だけ低下したならば、ポンプP-1を停止した。次に、ポンプP-3を用いて膜分離処理槽(circled-5)内に残っている被処理水を活性汚泥処理槽に移し、さらにジェット水で付着汚泥を洗い落とし、その洗浄廃水をポンプP-3を経由して活性汚泥処理槽に移し、膜分離処理槽(circled-5)を空にしてから、膜分離処理槽(circled-5)に水を導入し、次亜塩素酸ナトリウム1000 ppm、水酸化ナトリウム2%濃度となるように薬剤を投入し、全体の薬液量をおおよそ170 m<sup>3</sup>とした。薬液

apparatus, 30 above-mentioned separation membrane units were installed, and the volume of a membrane separation treatment tank (circled-5) was set to 200 m<sup>3</sup>.

In addition, the throughput per above-mentioned separation membrane unit is 50m<sup>3</sup> /day.

The volume of 1 unit is 2.4m<sup>3</sup> (unit height of 3.5m), and is 72 m<sup>3</sup> in 30 sets.

The running of an activated sludge treatment is started and that whose suction pressure of a pump P-1 was about 3m at the beginning shows 7m 6 months after.

Since the throughput of a separation membrane apparatus reduced to 45m<sup>3</sup> /day from 50m<sup>3</sup> /day, the immersion film was cleaned.

Supply of the treated water (raw water) 1 to an activated sludge treatment tank was stopped initially.

Then, from an activated sludge treatment tank (circled-4), a pump P-2 is made to operate to a membrane separation treatment tank (circled-5), treated water is moved, and a pump P-1 is also worked in the meantime.

The treated water of the almost same volume as a membrane separation treatment tank (circled-5) is made to eject.

When only the part of the same volume reduces almost an activated sludge treatment tank (circled-1) - (circled-4) liquid level with a membrane separation treatment tank (circled-5), a pump P-1 will be suspended.

Next, the treated water which has remained in the membrane separation treatment tank (circled-5) using the pump P-3 is moved to an activated sludge treatment tank.

Furthermore it is failed to wash adherence sludge with jet water.

After going through a pump P-3, moving the cleaning waste water to an activated sludge treatment tank and emptying a membrane separation treatment tank (circled-5), water is introduced into a membrane separation treatment tank (circled-5).

A chemical agent is thrown in so that it may become 1000 ppm of sodium hypochlorite, and

が満たされた状態で、極く短時間ポンプP-1を作動させ、薬液を分離膜の内部に浸透させた。その後散気装置3から少量の空気を送りこみ、膜分離処理槽(circled-5)内の薬液をゆっくり移動させ、分離膜装置をそのままの状態ですべて24時間浸漬した。その後、膜分離処理槽(circled-5)に酸化剤と当量分の還元剤としてチオ硫酸ナトリウムと硫酸を入れて中和してから、弁6を操作して槽内の液を排出した。その後は水洗浄することなく、活性汚泥処理槽へ被処理水(原水)1を供給し、活性汚泥運転を再開した。運転再開後のポンプP-1の吸引圧力は3m程度に回復し、分離膜装置の処理量も約49m<sup>3</sup>/日となった。

#### 【0020】

##### 実施例2

図1の構成の活性汚泥処理の設備を用いて、被処理水1500m<sup>3</sup>/日の処理を行った。被処理水(原水)および運転条件は実施例1と同様である。実施例1とは異なる中空糸濾過膜を使用しているが構造は同様の中空糸膜エレメントを容器内に収納した中空糸膜モジュールを準備し、該中空糸膜モジュール4個を組み合わせて、図2のような下部に散気管3を配した分離膜ユニットを配置した。浸漬型分

2% concentration of sodium hydroxide.

The entire amount of chemical solutions was about set to 170 m<sup>3</sup>.

The short-time pump P-1 is made to operate extremely, where a chemical solution is filled.

The inside of a separation membrane carried out permeation of the chemical solution.

A small amount of air is sent in from a diffuser 3 after that, and the chemical solution in a membrane separation treatment tank (circled-5) is made to move slowly.

The separation membrane apparatus was immersed for 24 hours in the condition as it is.

Then, after having put sodium thiosulfate and the sulfuric acid and having neutralised as an oxidizing agent and reducer for an equivalent to the membrane separation treatment tank (circled-5), the valve 6 was operated and the liquid in a tank was ejected.

A backwashing by water is not carried out after that.

Treated water (raw water) 1 was supplied to the activated sludge treatment tank, and the activated sludge running was restarted.

The suction pressure of the pump P-1 after a running restart was recovered to 3m grades, and the throughput of a separation membrane apparatus also became approximately 49m<sup>3</sup>/day.

#### [0020]

##### Example 2

The installation of the activated sludge treatment of the composition of Figure 1 is used.

1500m<sup>3</sup>/day of treated water was treated.

Treated water (raw water) and the service condition are the same as that of Example 1.

Although the hollow fibre membrane filter which differs in Example 1 is used, the structure prepares the hollow fibre membrane module which accommodated the similar hollow fibre membrane element in the container.

These four hollow fibre membrane modules were combined, and the separation membrane unit which distributed the aeration pipe 3 in the lower part as shown in Figure 2 has been

離膜装置として前記の分離膜ユニットを30基設置し、膜分離処理槽(circled-5)の容積を200m<sup>3</sup>とした。尚、前記の分離膜ユニット1基あたりの処理量は60m<sup>3</sup>/日であり、ユニット1基の容積は1.4m<sup>3</sup>(ユニット高さ2.6m)で、30基では42m<sup>3</sup>である。活性汚泥処理の運転を開始して6カ月後、ポンプP-1の吸引圧力が当初1m程度であったものが5mを示し、分離膜装置の処理量が60m<sup>3</sup>/日から50m<sup>3</sup>/日に低下したため浸漬膜の洗浄を行った。洗浄操作は実施例1の場合と同様に、最初に活性汚泥処理槽への被処理水(原水)1の供給を停止した。その後、活性汚泥処理槽(circled-4)より膜分離処理槽(circled-5)へポンプP-2を作動させて被処理水を移し、この間もポンプP-1を稼働させて、膜分離処理槽(circled-5)とほぼ同じ容積の処理水を排出させ、活性汚泥処理槽(circled-1)~(circled-4)の液面を膜分離処理槽(circled-5)とほぼ同容積の分だけ低下したならば、ポンプP-1を停止した。次に、ポンプP-3を用いて膜分離処理槽(circled-5)内に残っている被処理水を活性汚泥処理槽に移し、さらにジェット水で付着汚泥を洗い落とし、その洗浄廃水をポンプP-3を経由して活性汚泥処理槽に移し、膜分離処理槽(circled-5)を空にしてから、膜分離処理槽(circled-5)に水を導入し、次亜塩素酸ナトリウム3000ppm、水酸化ナトリウム2%濃度となるように葉

configured.

As an immersion type separation membrane apparatus, 30 above-mentioned separation membrane units were installed, and the volume of a membrane separation treatment tank (circled-5) was set to 200 m<sup>3</sup>.

In addition, the throughput per above-mentioned separation membrane unit is 60m<sup>3</sup>/day.

The volume of 1 unit is 1.4m<sup>3</sup> (unit height of 2.6m). In 30 sets, it is 42 m<sup>3</sup>.

After 6 months from starting the running of an activated sludge treatment, That whose suction pressure of a pump P-1 was 1m grades at the beginning shows 5m.

Since the throughput of a separation membrane apparatus reduced to 50m<sup>3</sup>/day from 60m<sup>3</sup>/day, the immersion film was cleaned.

Cleaning operation stopped initially supply of the treated water (raw water) 1 to an activated sludge treatment tank like the case of Example 1.

Then, from an activated sludge treatment tank (circled-4), a pump P-2 is made to operate to a membrane separation treatment tank (circled-5), treated water is moved, and a pump P-1 is also worked in the meantime.

The treated water of the almost same volume as a membrane separation treatment tank (circled-5) is made to eject.

If only the part of the same volume reduces almost an activated sludge treatment tank (circled-1) - (circled-4) liquid level with a membrane separation treatment tank (circled-5), a pump P-1 will be suspended.

Next, the treated water which has remained in the membrane separation treatment tank (circled-5) using the pump P-3 is moved to an activated sludge treatment tank.

Furthermore it is failed to wash adherence sludge with jet water.

After going through a pump P-3, moving the cleaning waste water to an activated sludge treatment tank and emptying a membrane separation treatment tank (circled-5), water is introduced into a membrane separation

剤を投入し、全体の薬液量をおおよそ130mとした。薬液が満たされた状態で、極く短時間ポンプP-1を作動させ、薬液を分離膜の内部に浸透させた。その後散気装置3から少量の空気を送りこみ、膜分離処理槽(circled-5)内の薬液をゆっくり移動させ、分離膜装置をそのままの状態に24時間浸漬した。その後、膜分離処理槽(circled-5)に酸化剤と当量分の還元剤としてチオ硫酸ナトリウムと硫酸を入れて中和してから、弁6を操作して槽内の液を排出した。その後は水洗浄することなく、活性汚泥処理槽へ被処理水(原水)1を供給し、活性汚泥運転を再開した。運転再開後のポンプP-1の吸引圧力は1m程度に回復し、分離膜装置の処理量も約59m<sup>3</sup>/日となった。

【0021】

## 【発明の効果】

本発明は、活性汚泥処理のような好気性廃水処理設備において、分離膜装置を浸漬した設備で分離膜を移動させることなくそのままの状態に、分離膜の透過能を回復させる効率的な浸漬膜の洗浄方法を提供できる。また、分離膜装置を浸漬して洗浄を行うので、均一に性能を回復することができる。このため、

treatment tank (circled-5).

A chemical agent is thrown in so that it may become 3000 ppm of sodium hypochlorite, and 2% concentration of sodium hydroxide.

The entire amount of chemical solutions was about set to 130 m<sup>3</sup>.

The short-time pump P-1 is made to operate extremely, where a chemical solution is filled.

The inside of a separation membrane carried out permeation of the chemical solution.

A small amount of air is sent in from a diffuser 3 after that, and the chemical solution in a membrane separation treatment tank (circled-5) is made to move slowly.

The separation membrane apparatus was immersed for 24 hours in the condition as it is.

Then, after having put sodium thiosulfate and the sulfuric acid and having neutralised as an oxidizing agent and reducer for an equivalent to the membrane separation treatment tank (circled-5), the valve 6 was operated and the liquid in a tank was ejected.

A backwashing by water is not carried out after that.

Treated water (raw water) 1 was supplied to the activated sludge treatment tank, and the activated sludge running was restarted.

The suction pressure of the pump P-1 after a running restart was recovered to 1m grades, and the throughput of a separation membrane apparatus also became about 59m<sup>3</sup>/day.

【0021】

## [EFFECT OF THE INVENTION]

In the aerobic waste water treatment installation like an activated sludge treatment, this invention can provide the cleaning method of an efficient immersion film which is in condition as it is and is made to recover the penetrating power of a separation membrane, without making a separation membrane move with an installation which immersed the separation membrane apparatus.

Moreover, since it cleans by immersing a separation membrane apparatus, a property is



実際の好気性廃水処理設備の運転に際しては、他の簡便な分離膜の洗浄方法と本発明の洗浄方法とを併用することにより、長期間にわたり安定した運転を維持することが可能になる。本発明では、好気性廃水処理設備における分離膜を高密度に設置し、安定して中空糸分離膜の性能を発揮させることが可能である。本発明の別の目的である好気性廃水処理設備における分離膜の設備を設置する場所についても、設備を新規に設置する場合だけでなく、既存の設備を利用してそれを改造するような場合においても容易に対応することができる。

uniformly recoverable.

Therefore, in case of the running of an actual aerobic waste water treatment installation, the running stabilized through the long period of time can be maintained by using together the cleaning method of the other simple separation membrane, and the cleaning method of this invention.

In this invention, the separation membrane in an aerobic waste water treatment installation is installed with high density.

It is possible to exhibit the property of a hollow fibre separation membrane stably.

Also about the place which installs the installation of a separation membrane in an aerobic waste water treatment installation which is another objective of this invention, When not only when installing an installation newly, but converting it using the existing installation, it can correspond easily.

#### 【図面の簡単な説明】

#### [BRIEF EXPLANATION OF DRAWINGS]

##### 【図 1】

本発明で使用する好気性廃水処理設備の説明図である。

##### [FIGURE 1]

It is the explanatory drawing of the aerobic waste water treatment installation used with this invention.

##### 【図 2】

分離膜ユニットの説明図である。

##### [FIGURE 2]

It is the explanatory drawing of a separation membrane unit.

##### 【図 3】

膜分離処理槽内の流動状態を示す説明図である。

##### [FIGURE 3]

It is the explanatory drawing showing the fluid state in a membrane separation treatment tank.

##### 【図 4】

本発明の別の実施態様を示す説明図である。

##### [FIGURE 4]

It is the explanatory drawing showing another embodiment of this invention.

#### 【符号の説明】

- 1 被処理水（原水）
- 2 分離膜ユニット
- 3 散気装置

#### [EXPLANATION OF DRAWING]

- 1 Treated water (raw water)
- 2 Separation membrane unit
- 3 Diffuser
- 4 Separation membrane module

- |  |          |   |       |  |
|--|----------|---|-------|--|
| 4  | 分離膜モジュール | 5   | Shell |  |
| 5  | シェル      | 6   | Valve |  |
| 6  | 弁        | P-1, P-2, P-3                                     | Pump  |  |
| P-1, P-2, P-3                                      | ポンプ      | (circled-1), (circled-2) (circled-3), (circled-4) |       |  |
|  |          | Activated sludge treatment tank                   |       |  |
| (circled-1), (circled-2), (circled-3), (circled-4) | 活性汚泥処理槽  | (circled-5)                                       |       |  |
|  |          | Membrane separation treatment tank                |       |  |
| (circled-5)  | 膜分離処理槽   |   |       |  |

【図 1】

[FIGURE 1]

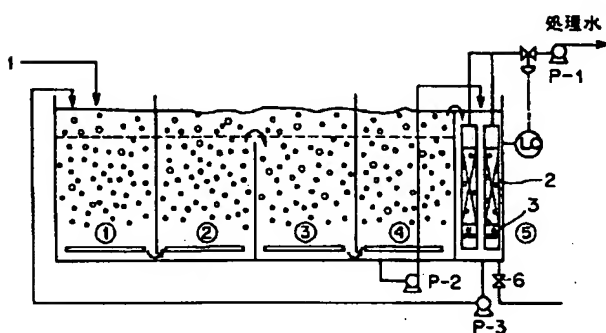
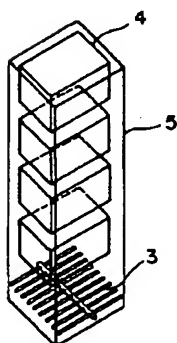


Figure 1: Treated water

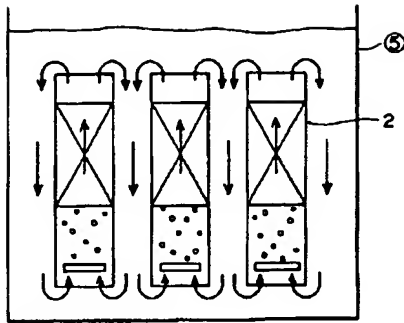
【図 2】

[FIGURE 2]



【図 3】

[FIGURE 3]



【図 4】

[FIGURE 4]

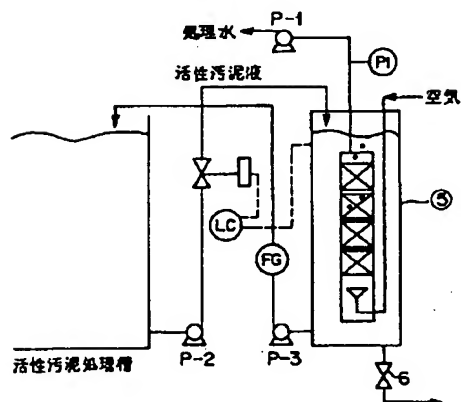


Figure 4(top to bottom): Treated water, Activated sludge liquid, Air,  
 Activated sludge treatment tank

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